Distr.
LIMITED

UNIDO/IO.579
26 March 1984

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ENGLISH

RECENT TRENDS AND UNIDO ACTIVITIES IN THE FIELD OF CONSTRUCTION IN DEVELOPING COUNTRIES*

Paper to be presented at the
Fourth Scientific Conference
of Engineering and Architecture
Cuba, 28 November - 1 December 1984

prepared by the
Chemical Industries Branch
Division of Industrial Operations

---

* The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This document has been reproduced without formal editing.

V.84-83985

TABLE OF CONTENTS

	Page No.
PREAMBLE	1
1. RECENT TRENDS IN THE CONSTRUCTION SECTOR	2
1.1 Introduction	2
1.2 Main Factors of Industrialization of Housing and Building Sector	3
1.3 A. Developed Market Economies	4
1.4 B. Centrally Planned Economies	6
1.5 C. Less Developed Countries	8
1.6 Some other Factors affecting Industrialization Policies	10
2. THE ACTIVITIES OF THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)	11
2.1 What is UNIDO ?	11
2.2 Functions	12
Diagrams: - Technical Co-operation Activities at a Glance (In millions of US $)	13
- Technical Co-operation Project Expenditures by Project Component, 1974-1982	13
2.3 Organization	14
2.4 Operational Activities	14
Diagrams - Technical Assistance Delivered by UNIDO in 1982 (In millions of US $)	15
- Distribution of Technical Co-operation Activities in 1982 (In millions of US $)	15
- Technical Assistance Delivered by UNIDO in 1982 (By geographical area, in percentages and millions of US $)	16
3. RANDOM EXAMPLES OF PROJECTS EITHER RECENTLY COMPLETED OR CURRENTLY ACTIVE IN THE FIELD OF BUILDING MATERIALS AND CONSTRUCTION SECTOR	17
3.1 Building Construction under Seismic Conditions in the Balkan Region	17
3.2 Low Cost Building Materials Technologies and Construction Systems	19

TABLE OF CONTENTS (Continued)

		Page No.
3.3	Assistance in the Development of Building Materials and Supplies Industry for Low-Cost Housing	20
3.4	Research and Development for Fly Ash Utilization	22
3.5	Energy Conservation in the Operation of Buildings	23
3.6	Heat-Insulation Systems for External Parts of Buildings	24
3.7	Establishment of a Ceramic Research and Development Laboratory	25
3.8	Development Support to Small-Scale Production based on Red Clay and Lime	26
3.9	Further Development of Microclimate Laboratory for the Elaboration of Energy-Saving Dimensioning and In-Door Air Pollution Testing Methods	27
3.10	Workshop on Selected Building Materials for Housing and other Low-Rise Buildings	27
3.11	Assistance in the Marble and Stone Industry	28
3.12	Research and Development Centre for Light Building Materials	29
3.13	Pilot Study on Natural Resources	29
3.14	Workshop on Building Industrialization	30
3.15	Technical Consultation on the Protection of Buildings from Earthquakes by Base Isolation	31

PREAMBLE

This paper contains three parts.

In Part One, an attempt is made to identify the main factors influencing the development of housing construction technologies and its industrialization. In this way recent characteristic trends of construction in developed market economies, in centrally planned economies and in less developed countries are outlined.

In Part Two, the United Nations Industrial Development Organization is introduced. UNIDO's task, organization and functions are explained, with particular emphasis to the work carried out in the field of Industrial Operations.

Finally, in Part Three, some typical on-going and completed UNIDO projects in the field of building materials and construction industry are presented. These should give a better understanding of UNIDO's operational activities in this field and give a guidance to those wishing to apply for UNIDO's assistance in the development of their country's building sector.

1. RECENT TRENDS IN THE CONSTRUCTION SECTOR

1.1 Introduction

Housing technologies have been based until recent time on tradition and empiric experience. Buildings had to be produced on the same place where their use was planned. Craftsmen (carpenters, masons) and master-builders were moving from one place to another; building materials (due to their low value related to their weight), usually have not been transported to great distances. Local resources of stone, clay, timber, affected the construction technologies.

Buildings have been individual and not mass-produced products and serial production has been exceptional.

In the course of industrial revolution, manufacturing of products became industrialized. In the building trade this development was delayed. Apart from some attempts for industrial construction all over the world, building remained a complexity of labour-intensive processes carried out by a great number of small contractors and craftsmen. This backwardness of building technologies gradually became the bottleneck of overall development. In our century, demand for new buildings increased rapidly. Consequently, the industrialization of the building industry became unavoidable.

The industrialization of building is not a smooth process. The fear that it will create unemployment and will eliminate from the market many small firms and craftsmen, caused resistance to this process.

In some countries too great steps from traditional to modern methods made industrialized construction uneconomical, thereby giving a bad reputation to industrialization. The same negative assessment of industrialization was caused in some cases by technical failures and by unaesthetic appearance.

All this justifies a close look at this process of industrialization with specific regard to conditions in developing countries. One has to find out whether industrialization is a universal phenomenon or one with a validity under certain conditions only; whether its characteristics are universal or differing in order to be able to outline optimum plans for the technical future of a country's housing and building industry.

In the following, this will be attempted.

1.2 Main Factors of Industrialization of Housing and Building Sector

Industrialization of this sector comprises in general the following:

- Prefabrication and industrial manufacturing of components;
- Mechanization and up-to-date organization of on-site processes;
- Use of new materials, components, equipment - conservation of resources;
- Modernized design and management methods - use of computers;
- Application of building research results and innovations;
- Modernization of codes and standards based on new principles;
- Provision of human settlements with services: Water, sewage disposal, electrical energy, gas, transport, telecommunication.

In a given country and within a given period, the individual factors will not have equal weight; some may be dominant, whereas others may scarcely be applied. Still, we may say that some sort of industrialization is inevitable in each country; the good selection of the factors results in a more efficient housing and building industry, on the other hand, resistance to industrialization or the selection of the wrong factors may adversely affect development.

Obviously, no such thing as a universally applicable ideal industrialization policy exists. Nevertheless, one may attempt to define typical trends requiring certain typical industrialization policies.

To this end one should bear in mind, that housing and construction is an activity which is a function of the socio-economic system of every single country. In order to identify on a global scale the main prevailing trends in new housing technologies, it will be useful to reduce the almost infinite variety of socio-economic systems to three fundamental ones: Those of (A) developed market economies, (B) centrally planned economies and those of (C) less developed countries.

It is obvious that such a model can be no more than an over-simplification of the reality. None of the three parts of the world is monolithic; in each, one can find simultaneously different technologies. Nevertheless, it is felt that the model describes correctly certain major specific features in these regions to justify its use as an aid to forecasting the future.

We shall not employ any formal mathematics because our objective is not quantitative forecasting; our concern is to forecast typical changes to be expected in technologies. In the following three sections, conditions prevailing in the three parts of the world will be defined, focussing specially on how these affect construction technologies. In a subsequent section an attempt will be made to forecast the possible future of construction technologies.

1.3 A. Developed Market Economies

Countries with developed market economy are amalgamated in this particular group. Typical examples are Northern and Western Europe, USA, Canada, Australia and Japan. The GNP per capita in most of the countries in this group is over US$ 8,000. Industry as a whole is highly developed and can supply the housing and construction sector with up-to-date building materials, components, equipment and machinery. The majority of new housing is carried out by the construction industry and a smaller part only by the informal subsector. Alongside the large contracting firms with sufficient capital, there exist also many small firms and this may constitute an obstacle to certain technical innovations.

Most of these countries - or at least part of them - are densely populated; urbanization has reached in all a high level and there is a good transport infra-structure (roads, waterways, railways, etc.).

During the Second World War, little new housing came into being and in several of those countries a substantial part of the formerly existing housing stock has been destroyed. This gave rise to a housing shortage which was further aggravated by natural population increase, migration and the decrease of the average size of households increasing simultaneously the number of independent households.

The thirty years from 1945 to 1975 witnessed a boom in new housing. As a consequence, the majority of the population became well housed although everywhere those with low incomes (and these account for several millions) experienced difficulties in acquiring adequate shelter.

The production potential of the construction industry even during this period was able to satisfy the demand but to achieve this it had to develop and use industrialized techniques and innovations. Some of the post-war technical improvements have been:

- modernized concrete technologies (precast and cast-in-situ, ready-mix-concrete);
- prefabrication of timber-frame and steel-frame houses and mobile homes;
- new lightweight components (gypsum-board, plywood, particle board, light gauge steel sections, acoustic ceiling tiles);
- use of plastics (for piping, carpeting, bathroom fixtures, painting, sealing);
- energy conservation measures (insulating glass, heat pumps, heat storage, use of solar energy, improved gas, oil and electric furnaces).

All this led to an increase in the productivity of labour. Due to the fragmented character of new housing, continuity of demand was not assured and this - even during the period of upswing - hindered large scale industrialization of the sector.

The two main forms of new housing have been the low-rise and the high-rise. In some countries (Sweden, France) high-rise was dominant during many years. In others (USA, Japan etc.) low-rise was (and remained) dominant. In recent years the share of new multi-storey housing has diminished; most families now tend to prefer low-rise housing. This trend has been strengthened by tax incentives for house ownership. For low income families, rented housing (predominantly in multi-storey apartment blocks) cannot be avoided altogether and in some countries recently attempts were made to increase the (public) subsector of rented housing.

Throughout the last decade, economic conditions have deteriorated. High interest rates, umemployment and reduced natural population-increase among other factors, have all diminished demand. New housing also has been reduced. It has become even more difficult than before for young families, recently arrived immigrant workers and in general for socio-economically weaker groups, to acquire housing. The slackened demand and the high interest rates adversely affected the capital intensive industrialized techniques. The construction industry could provide sufficient supply without having recourse to such technologies. On-site industrialized techniques (e.g. béton banchè) survived somewhat better. It has been felt also that large scale typification and industrialization are more likely to result in monotonous architecture. New multi-storey large panel techniques have shrunk to negligible proportions, the more so because some technical dificiencies (mostly from the initial period) brought disreputation to this technology. Prefabrication of light-weight framed houses on the other hand has retained its market share.

In relation to new construction, maintenance, modernization and rehabilitation gained in importance. Municipalities now try to avoid large scale slum clearance; all this reduces the demand for new (industrialized) housing.

A modest revival in demand will bring marginal changes only. No return on a substantial scale to "grands ensembles" based on multi-storey large panel technologies can be expected.

1.4 B. Centrally Planned Economies

Within this group, we consider first of all, the Soviet Union and the East European Socialist countries. China, Vietnam, North Korea, can be included to some extent in this group, to some extent however, they belong to (C).

Most of the countries in this group had underdeveloped economies, agriculture prevailed over industry, the majority of the population was rural and housing conditions were bad. In several countries, war destroyed much of the housing stock and the amount of new housing was low for many years because of the needs of the war and then the reconstruction of the economy.

The demand for new housing grew as a result of the accelerated development of industry which resulted also in a rapid expansion of the urban population. The introduction of central planning favoured large scale new housing programmes. Quantity was considered the highest priority; large residential areas, major new towns have been planned and built on what was formerly unbuilt ground. Large scale typification of building designs has been the basis for the prefabrication and mass production of building components. Great state-owned contracting organizations could and did afford to introduce capital-intensive prefabrication and assembly techniques. State-owned organizations also became the designers and the clients of new housing. This situation gave rise to new housing on a large scale but the same factors frequently created new housing estates lacking satisfactory quality and adequate aesthetic values.

Due to the great housing shortage and the restricted financial means, the dwellings have been small if compared to Western standards, but even so they constituted a substantial improvement to the housing conditions of the population. The housing shortage frequently compelled families to more into dwellings which were smaller than their needs, so that homes in new residential areas immediately became overcrowded and the new dwellings failed to give the user complete satisfaction.

Multi-storey buildings have been - and are still - dominant in countries of group (B). This enabled the construction industry to establish large capacity factories producing large size reinforced concrete panels. Catalogues (product files), have been published for the typified (standardized) components of the buildings. Innovation and technical development have been extended to the use of the system theory and computer-aided design and manufacturing (CAD and CAM). All this together formed the basis to a high capacity construction industry producing continuously great numbers of dwellings.

Low-rise housing is restricted in most countries with Centrally Planned Economy to rural areas and in some countries to the outer districts of towns.

Migration within the country is more or less controlled in these countries and therefore, there scarcely if at all, exist squatter settlements. Informal construction may occur in low-rise housing, mostly in rural areas.

Since 1975, this part of the world has also been strongly affected by economic recession. The drop in new housing has not been as substantial as in the Developed Market Economies - quite high levels of new construction activities are being maintained but maintenance, modernization and rehabilitation are being given additional attention in these countries also.

These countries further are engaged in major efforts to eliminate deficiencies in municipal services. Earlier, their rural population was poorly provided with running water, sewage disposal, electricity. This situation has now to be remedied simultaneously with the rapid growth of urban settlements.

1.5 C. Less Developed Countries

This group comprises a great number of countries in which the GDP per capita varies from US$ 200 to US$ 2,000. When characterizing conditions in this group, we shall rather keep in mind those countries which are least developed, though we shall try to make statements valid for all.

All over the world, constructions are being carried out either by the (formal) construction industry or in some kind of informal (spontaneous, popular, illegal, etc.) way. In the developed countries, the share of the informal sector is small though it can go up to as high as 20 per cent. In less developed countries the share of informal constructions is much higher and can attain 70 to 80 per cent.

The majority of the population in less developed countries is rural and rural new housing is mostly based on local materials, informal and very frequently non-monetary methods of construction.

Industrialization of such rural housing is restricted in its scope, though even this restricted scope can have great importance.

Industrialization of rural housing contains on the one hand improvements of traditional methods (e.g. of block-making, improving the durability of timbers, bamboo, etc.), on the other hand it may comprise the supply of components with key importance being otherwise in shortage (e.g. roofing planks, doors, windows, water pumps). It can comprise the introduction of new and simple equipment and processes, e.g. of lime and cement kilns.

Despite the fact that the population in less developed countries is predominantly rural, housing of the urban poor can constitute an even more serious problem. The reason for this is that those who migrated recently to the urban areas cannot any more solve their need for a shelter by the traditional methods they have been used to in rural areas (due to a lack of natural resources and the lack of the rural set-up of cooperation in construction); on the other hand, they lack the regular income required in urban areas in order to become clients of mortgage banks and the formal construction industry. Families put together make-shift shelters, become squatters, establish shanty-towns.

The housing problems of the low-income new immigrant population of rapidly growing cities have attracted interest. Experience with the exploding urban population, with squatter settlements and slums, have given rise to various (oppressive, supportive, laissez-faire) policies in different countries.

One of these policies was grounded on the assumption that, with security in land tenure, housing conditions in squatter settlements would spontaneously improve without institutional intervention. Other sources found quite the opposite and an important criticism of this (Turnerite) School of Thought was that it "depoliticizes" the housing problem.

Housing policies affect industrialization policies. If institutional intervention is unnecessary or even harmful, then industrialization should be restricted to the same components as in rural construction. If on the other hand institutional intervention should be planned and carried out, then (simple) industrialized systems also could be introduced.

1.6 Some other Factors affecting Industrialization Policies

In the preceding parts the influence on industrialization policies of economic development levels was studied. Some other factors also affect substantially industrialization policies.

One of these is the size and concentration of demand. In small countries with a low density of population demand is not too big and is not concentrated. This does not justify e.g. prefabrication. On the other hand, in big countries and/or in big urban conglomerates demand is big and concentrated. The great number of buildings (houses, dwellings, schools, shops, etc.) to be built, justify capital investments in prefabrication plants and building machines.

The geographic spread of demand is a major factor in defining industrialization policies. Beyond this, the characteristics of the transport net system is important. With good roads (railways, waterways), materials and components can be moved to great distances; the contrary is true if roads (railways etc.) are not available or are not of good quality.

The introduction of any component(s) of industrialization in most cases does not require new basic research; it is possible by adapting existing knowledge to local conditions and by applying existing knowledge. If research is not of primordial importance, transfer of knowledge is extremely important. This frequently is underestimated though adequate systems of documentation, information transfer, education, training, demonstration are basic requirements for success.

In the three parts of the World, three trends of building technology have been described. To some extent, however, each of these technologies find application in all three parts of the World, though their relative share is different.

It has to be stated therefore, that there is inherent danger in relying solely on one single type of technology. Construction is affected by a great number of factors and its technologies can be selected by careful analysis of all factors only.

Industrialization of construction is a trend which has a validity practically for all countries whether developed, less or even least developed. The objectives are always the same; to make construction more efficient. The actual solutions however, are different and have to be defined depending on a country's conditions in a given period. The study of industrialized techniques used in other countries is useful and even necessary, but no technical solution should be copied blindly. The optimum policy of industrializing construction has to be worked out for each country separately and even that has to be revised from time to time and has to take account of different conditions within the country (urban, rural, etc.).

If all this is being taken care of, industrialization of construction will contribute to the overall development of the countries.

2. THE ACTIVITIES OF THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

2.1 What is UNIDO?

The United Nations Industrial Development Organization (UNIDO) was formed in January 1967, with a brief "to promote and accelerate the industrialization of the developing countries". UNIDO was also given the responsibility of coordinating all United Nations activities related to its sphere. Vienna was selected as the site of UNIDO headquarters following an offer of suitable facilities by the Government of Austria.

Under the terms by which it was established, UNIDO is an integral part of the United Nations. All States Members of the United Nations together with members of the specialized agencies and the International Atomic Energy Agency are eligible for election to the policy-making Industrial Development Board on which 45 States are represented. At each annual General Assembly, 15 members are elected to serve on the Board for a three-year term, an agreed system of quotas ensuring an equitable geographical distribution.

The task of UNIDO is to provide industrial assistance to the developing countries of the world at their request. Thus the projects of UNIDO are, in a sense, self-help programmes: there is no paternalism, no indebtedness and no imposition of plans or programmes. All recipient countries are full and equal States Members of the United Nations family, contributors to the Organization's main funding sources, and ultimately the arbiters of their own pattern of industrial advance.

2.2 Functions

In fulfilling its mandate, UNIDO:

a) Provides assistance to developing countries, particularly in expanding, modernizing and operating their industries, including agro-based or agro-related and basic industries;

b) Undertakes operational activities, including measures for effective application of modern methods of industrial production, programming and planning, and establishment and strengthening of industrial institutions; development, adaptation and transfer of technology; and training of personnel;

c) Provides a forum and acts as an instrument for the developing and industrialized countries in their contacts, consultations and negotiations directed towards industrialization of the developing countries;

d) Assists developing countries to obtain external financing for industrial projects;

e) Offers advisory services, in co-operation with other United Nations bodies, on the exploitation and efficient utilization of natural resources, industrial raw materials, by-products and new products;

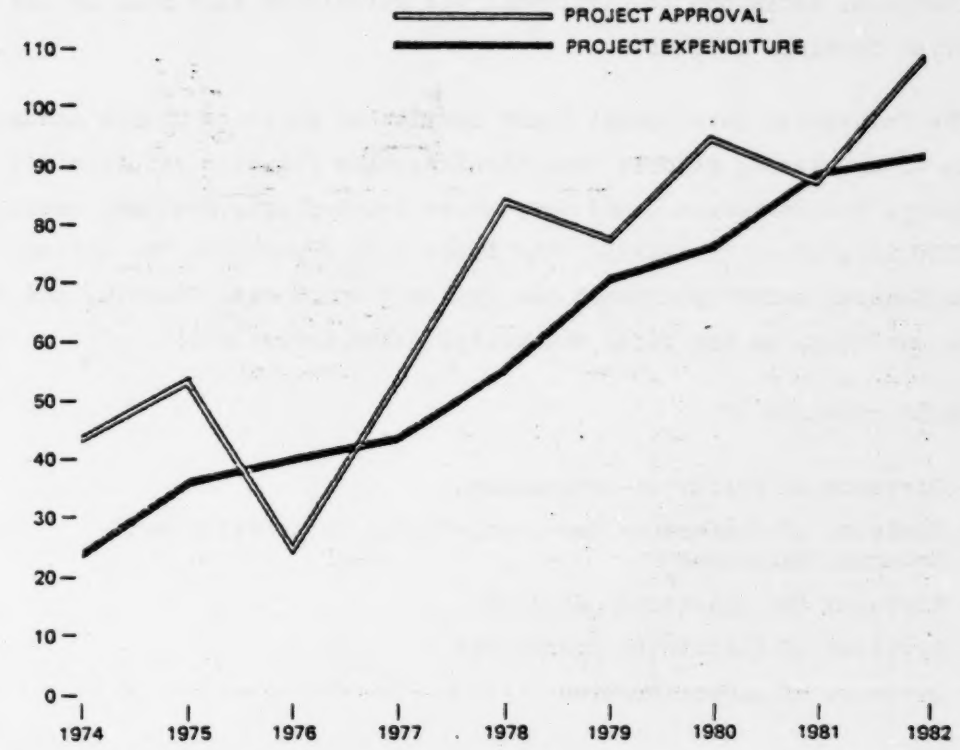
f) Co-operates with regional commissions in industrial development planning and in regional consultations, paying particular attention to the needs of the least developed countries;

g) Develops concepts and undertakes action-oriented studies and research programmes to facilitate the activities mentioned.

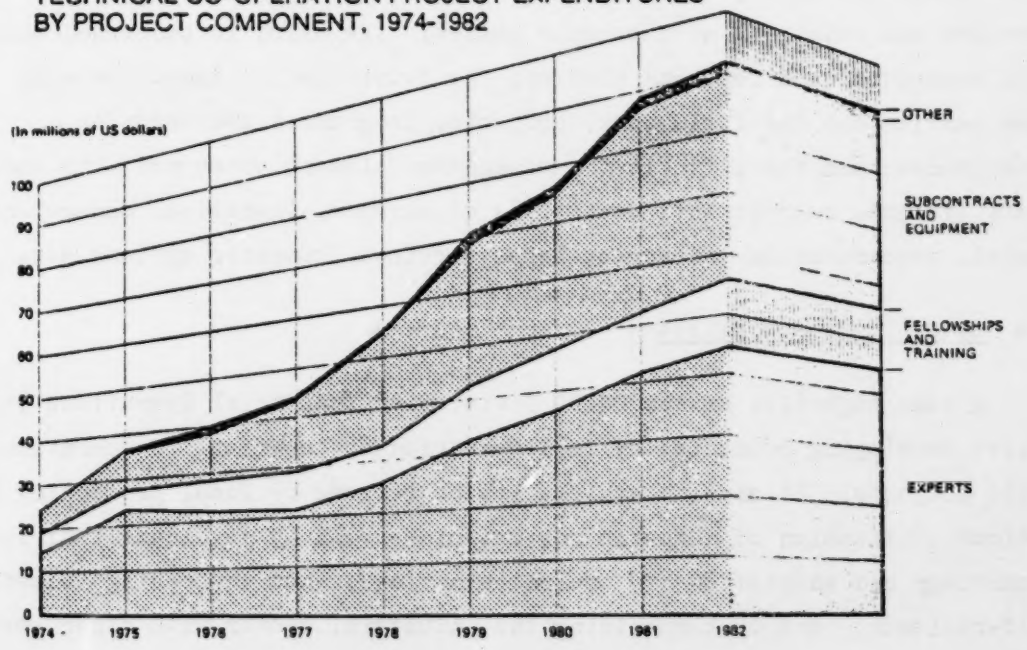
h) Reviews and promotes co-ordination of all activities of the United Nations system relating to industrial development.

TECHNICAL CO-OPERATION ACTIVITIES AT A GLANCE

(In millions of US dollars)



TECHNICAL CO-OPERATION PROJECT EXPENDITURES BY PROJECT COMPONENT, 1974-1982



2.3 Organization

The Executive Director is responsible for all programmes and organizational decisions to implement the guidelines laid down by the Industrial Development Board.

The Industrial Development Board decides on policies at its annual meeting after hearing reports from the Executive Director and from its subsidiary, the Permanent Committee, whose twice-yearly meetings examine all UNIDO activities in detail. The Board then reports to the United Nations General Assembly through the Economic and Social Council, and the General Assembly, as the final authority, takes decisions.

UNIDO consists of:

- Division of Policy Co-ordination
- Division of Conference Services, Public Information and External Relations
- Division for Industrial Studies
- Division of Industrial Operations
- Division of Administration

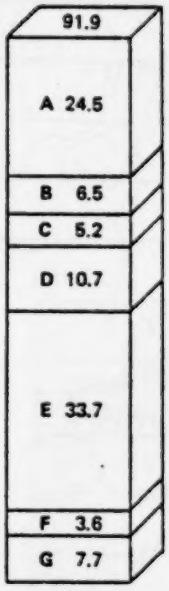
The titles of these five Divisions, which control the working of UNIDO, are largely self-explanatory but broadly, the first evolves and gives shape to UNIDO policies; the second deals with inter-organizational services and relations with outside bodies; the third is concerned basically with conceptual and research studies; the fourth is the executive wing that carries out the field-work, projects, programmes and training commitments; and the fifth is the management element concerned with budgets, staff affairs, recruitment, conditions of service, logistical management, travel, accommodation and works, legal services, computer systems etc.

2.4 Operational Activities

A main objective of the UNIDO Division of Industrial Operations is to assist developing countries by implementation of technical co-operation field projects. It aims to achieve its objectives by local processing and optimum utilization of domestic raw materials both by development of local technology and adaptation of foreign technology, thus increasing industrial self-reliance; and by harmonizing the industrial sector with other sectors

TECHNICAL ASSISTANCE DELIVERED BY UNIDO IN 1982

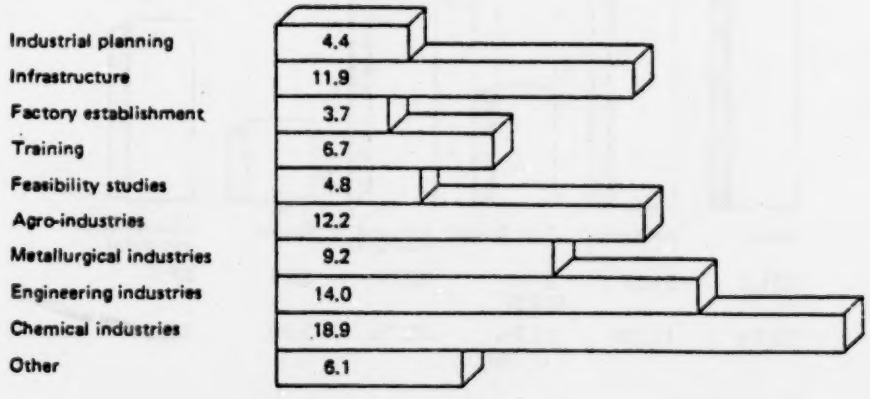
(In millions of US dollars)



A + B	Africa
B	African Arab States
C + B	Arab States
D	Americas
E	Asia and the Pacific
F	Europe
G	Global and interregional

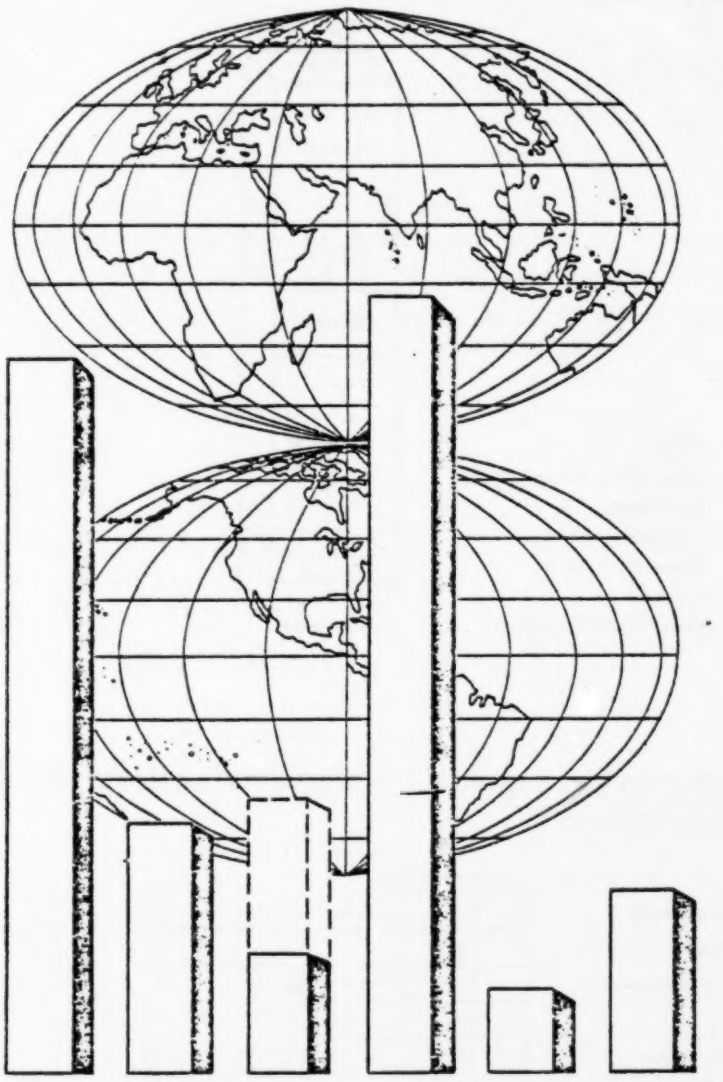
DISTRIBUTION OF TECHNICAL CO-OPERATION ACTIVITIES IN 1982

(In millions of US dollars)



TECHNICAL ASSISTANCE DELIVERED BY UNIDO IN 1982

(By geographical area, in percentages and millions of United States dollars)



Africa	Americas	Arab States*	Asia and the Pacific	Europe	Interregional and global
$31.0	$10.7	$11.7 ($6.5)	$33.7	$3.6	$7.7
33.7%	11.7%	12.7% (7.1%)	36.7%	3.9%	8.4%

*Broken lines and figures in parentheses give an indication of the African Arab States which are also included under the column "Africa".

of the economy in order to promote integrated economic development. Field projects embrace four main elements: the provision of experts to assist and advise; provision of services of consulting firms for sub-contract work in the establishment of industrial undertakings; provision of fellowships, single or in groups, as a means of developing local expertise; and assistance in the equipment of testing, development and pilot plant facilities.

The world-wide operations of UNIDO cover virtually every branch of industrial enterprise, and are available to any developing country at the request of its Government. Officers of the Division of Industrial Operations are constantly in touch with the newest technical advances in their particular sectors of industry, and thus help to sustain not only the increasing volume but also the quality of technical assistance. The increase in the Technical Assistance Programme is partly attributable to the higher priority now being given by a number of developing countries to their industrial development.

3. RANDOM EXAMPLES OF PROJECTS EITHER RECENTLY COMPLETED OR CURRENTLY ACTIVE IN THE FIELD OF BUILDING MATERIALS AND CONSTRUCTION SECTOR

3.1 Building Construction under Seismic Conditions in the Balkan Region

(Bulgaria, Greece, Hungary, Romania, Turkey and Yugoslavia)

Duration: 3 years

UN input: US$ 756,000

Government input: US$ 1 million

Development objectives:

To reduce seismic risk to human life and property in the areas of the Balkan Region and increase economic efficiency of building activities, through the organization of a joint effort between the participating Governments and the specialized institutions in the countries of the region.

This development objective will be achieved by:

a) Insuring continuous co-operation in research and development, training and exchange of information in the field of building construction under seismic conditions;

b) Developing materials, components, structural and building systems, model designs, building technologies and organization for construction under seismic conditions.

Immediate objectives:

Objective 1

Establishment of a regional network of co-operating research institutions in the Balkan Region capable of assisting the building sector to expand its present capacity to respond effectively to the needs arising from seismic conditions. The Project assists in strengthening the existing institutions, in the development of the newly established research organizations and in the familiarization of the engineers and technicians, with the practical tools and methods for the solution of problems relevant to the existing and planned seismic construction. The Project developed a programme of work for the network.

Objective 2

Study of the earthquake behaviour and earthquake resistant design of traditional construction, e.g. stone, brick, adobe masonry buildings, with due consideration to local materials and practices; of steel or reinforced concrete buildings (frame type or shear walls type), cast in situ or prefabricated, taking into account the effects of ground conditions and foundation systems, with due consideration to the case of unstable soils. These studies are performed with a view to the development of model designs, design aids, regulations, handbooks, and similar documents.

Objective 3

Development of methods and techniques for assessing the earthquake resistance, strengthening and repair of existing undamaged or damaged construction, and proper demolition procedures of structures damaged beyond repair.

Objective 4

Development of methods and techniques for assessing earthquake resistance, strengthening and repair of cultural and historical monuments, and urban nuclei.

Objective 5

Increasing the familiarity of the researchers, engineers and technicians of the participating countries with the problems and the status of research, design in earthquake engineering and the aseismic construction practices, including innovative aseismic building technologies.

3.2 Low Cost Building Materials Technologies and Construction Systems

(Afghanistan, Bangladesh, People's Republic of China, Fiji, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Federated States of Micronesia, Marshall Islands, Solomon Islands, Tonga, Tuvalu)

Duration: 5 years

UN input: US$ 515,000

Development objectives:

To facilitate the construction of lower cost housing units for urban and rural areas which are of relatively durable and better quality through industrialized methods and adaptation of appropriate technologies in the manufacture of building materials and in housing construction utilizing locally available resources.

Immediate objectives:

The project will facilitate technical co-operation and mutual assistance among the participating developing countries in the development of lower cost building materials and adaptation of construction designs and techniques through the establishment of an operational regional network capable of:

a) Gathering and disseminating technical information on the technologies, techniques, processes, research results on building materials and appropriate construction technologies, systems and design for lower cost structures in particular through state of the art reports, newsletters, semi-annual reports, technology manuals, directories and bibliographies;

b) Identifying, initiating and co-ordinating inter-country research and development programmes of common interest in low-cost building materials as well as in the preparation of feasibility studies in pre-casting or prefabricating plants for mass production of standard building materials and components;

c) Arranging for the provision of consultancy/advisory services in appropriate research activities on manufacturing processes and/or construction techniques for low-cost building materials;

d) Organizing training programmes, individual fellowships, seminars/ symposia, workshops and study tours, utilizing countries' TCDC contributions to the extent possible, to cover the various aspects of building materials research, testing and application of research results for low-cost building construction, construction techniques and equipment, and planning, programming and implementation of low-cost building constructions.

e) Providing support to regional and country exhibition centres for display of building materials and components (as well as improved housing designs) produced in the participating countries.

3.3 Assistance in the Development of Building Materials and Supplies Industry for Low-Cost Housing

Indonesia

Duration: 4 years

UN input: US$ 2,700,000

Government input: Rp. 2,351,600,000

Development objectives:

a) The basic aim of the State Policy Guideline (GBHN) is to provide adequate housing in healthy living environment, particularly for those who belong to the low income groups;

b) To achieve such an aim, complementary to Government efforts, the participation of the private sector is expected. In order to enhance the private sector participation the Government has taken a number of policy measures facilitating availability of mortgage financing and land acquisition among others;

c) Large scale low-cost housing development, requires large and continuous supply of low-cost building materials, which should be easily available. It means a challenge to the industrial undertakings in the production of low-cost building materials and low-cost housing construction techniques, especially utilizing available local materials;

d) The current Third Five Year Development Plan - REPELITA III, lays great emphasis on the provision of housing and calls for construction of 600,000 low-cost houses. 500,000 transmigrant houses and large numbers of schools, hospitals, etc. in addition to other urban and rural renewal and rehabilitation programmes to be carried out by the Government and other developers. REPELITA IV will continue these probrammes with increased activities which will be based on the practical experiences gained through REPELITA III. Special emphasis will be devoted to measures leading to equitable distribution of development;

e) The project's development objective is to assist in the realization of the above targets by establishing a system of co-ordination of the multi-sectoral/departmental activities for promoting the production of building materials and equipment, and the construction industry. The project will address itself to Government activities as well as to private sector activities;

f) Specifically, effort will be directed to assist the implementation of co-ordinated planning at the Ministry of Industry in co-operation with the Ministry of Public Works, Ministry of Manpower and Transmigration, Ministry of Health, and Ministry of Education and Culture, in order to couple their programmes of construction and development with promotion of improved production of domestic supplies of building materials and equipment for timely provision at or near the construction areas, in required quantities and quality;

g) In view of the proposed REPELITA IV priority for creating a capacity to produce machinery and equipment to support the development of various sectors, particular attention should be given to promoting such capability for this sector;

h) An important consideration will be to plan for continued operation of the production facilities thus created after the completion of the Government programmes of construction at the target sites/locations, by effectively stimulating the private sector Housing/Construction industry.

Immediate objectives:

In concrete terms the immediate objective of the project is to achieve a near complete supply of building materials and equipment from local sources for the Government's low-cost housing, transmigration housing, school and hospital buildings construction programmes during the REPELITA III and partly the REPELITA IV period. Realizing however, the gestation period and associated time lags, the following are specified as immediate objectives of the project:

a) Establishment of:

i) An operational/roving Planning Team at the Government Agencies involved in this project and located at Jakarta, to deal with the system of co-ordination planning and implementation of Government's low-cost housing, transmigration housing, school and hospital buildings and related programmes, especially with a view to assessing the time and location based requirements of building materials, supplies and equipment for these programmes and to prepare an implementation programme for ensuring adequate and timely supplies at desired locations.

ii) An operation of up to three (3) regional operation/ planning teams to implement the programmes prepared in (i) above, with respect to the concerned regions.

iii) An operation of up to five (5) model programmes for the implementation of selected PERUMNAS and Transmigration, etc. construction projects for demonstration.

b) Identification and implementation of opportunities for support by the national Research and Development Institutes with a view to mobilize and develop national technical expertise for the implementation of above.

c) Identification and implementation of new business opportunities for production and supply of required materials and equipment in co-operation with respective Government programmes.

3.4 Research and Development for Fly Ash Utilization

The People's Republic of China

Duration: 2 years

UN input: US$ 700,000

Government input: ¥ 3,992,200

Development objectives:

To establish a Research and Development Centre for Fly Ash Utilization. The Centre will be reponsible to carry out research and development work and to promote the fly ash utilization industry in order to increase the yearly fly ash utilization.

The Centre will ultimately provide the whole of China with advice on comprehensive utilization techniques including data on materials performance, manufacturing processes and equipment, building structure construction techniques and will render technical consultations and on-site technical guidance for modernized building construction.

Immediate objectives:

The objectives that should be obtained by the end of the project are as follows:

a) From the inner structure of concrete, determine the influence of various quantities of fly ash admixtures on concrete strength and concrete durability and rational amount (to the maximum) of fly ash to be used as various cement admixtures in concrete for the purpose of popularizing the application and increasing fly ash utilization rate.

b) Improve and perfect the manufacturing process for steam-cured lime-fly ash concrete blocks mainly by reforming moulds, shortening curing cycle and using synthetic lighweight fly ash aggregate.

c) Develop and improve manufacturing techniques for synthetic lightweight fly ash aggregate used in load-bearing structures.

d) Develop and improve the structural performance and applied techniques of aerated fly ash concrete, corrosion-resistant coatings for steel reinforcement and verify its application range in the light of the specific climate conditions in the Shanghai region.

3.5 Energy Conservation in the Operation of Buildings

Hungary

Duration: 2.25 years

UN input: US$ 100,000

Government input: Ft 3,973,000

Development objectives:

It is of primary importance for Hungary to keep the annual growth rate of energy consumption under control. This project is intended to contribute to the realization of this goal in the field of the construction and operation of buildings.

According to long-term plans, by the 2000 the production of the Hungarian construction industry will grow by 40 per cent over the 1980 level. However, the corresponding energy requirement should not increase by more than 12 per cent.

In the operation of buildings the target set by the long-term plans is to achieve a decrease of specific energy consumption by 20 per cent in dwellings and 10 per cent in communal buildings constructed after 1980.

Immediate objectives:

The immediate objective of the project is to transfer R and D results to the practical application by strengthening the laboratories of the Hungarian Institute for Building Sciences in order to deal with:

a) Utilization of solar energy for auxiliary hot-water supply and eventual heating of one-family houses and small public buildings.

b) Energy conservation in the establishment and operation of automatically controlled Heating, Ventillating, Air Conditioning (HVAC) systems.

3.6 Heat-Insulation Systems for External Parts of Buildings

Socialist Federal Republic of Yugoslavia

Duration: 3 years

UN input: US$ 148,300

Government input: Dinars 10,000,000

Development objectives:

Yugoslavia depends heavily on imported sources of energy, particularly oil which adversely affects its balance of payments. A number of measures are being taken to redress this situation including new sources of energy, but also more economical use of what is available by emphasizing inter-alia benefits of insulation

applications. The ultimate objective within the development plans of Yugoslavia is to reduce dependence on heavily imported energy resources, offset the balance of payments to the benefit of Yugoslavia and release savings attained for other priority areas.

Immediate objectives:

The immediate objective of the project is to determine - by collection of data, testing, and analyses - the optimum heat insulation of buildings for the prevailing climatic conditions in the Socialist Republic of Slovenia. Besides technical, design and economic factors, present regulations will be evaluated and new ones, if necessary adopted.

3.7 Establishment of a Ceramic Research and Development Laboratory

Sri Lanka
Duration: 2 years
UNIDO input: US$ 1,005,800
Government input: Rs 1,848,850 (in Kind)

Development objectives:

The project will:

a) Strengthen the economy of the country by enabling it to make more efficient use of its natural and human resources.

b) Broaden the basis of employment through adequate training and specialization.

c) Enhance earning of foreign exchange while reducing imports of goods and energy.

Immediate objectives:

a) Identify and characterize local ceramic raw materials in order to make more efficient use of them.

b) Develop, wherever necessary, suitable treatments for the available raw materials to make them more amenable for use.

c) Investigate and develop alternate technologies with the aim of either improving the quality of the presently manufactured products or in order to reduce the costs.

d) Qualify the technical staff necessary to carry on the work of the laboratory after termination of the project.

e) Develop alternate sources of energy.

3.8 Development Support to Small-Scale Production Based on Red Clay and Lime

Mozambique

Duration: 18 months

UNDP input: US$ 371,000

Development objectives:

a) To raise the technical capacity of the local populations in the manufacture of clay and lime, making these communities self-sufficient in these products.

b) To develop units of production by adapted technology.

c) To better housing conditions.

d) To create a model for the generalization of these activities for the whole country.

e) To increase the work opportunities in the sector using local raw materials.

Immediate objectives:

a) To evaluate geological information available in the different national agencies.

b) To select areas of high mineral potential in Gaza, Nampula and Tete Provinces.

c) To take samples and test the selected areas for industrial purposes.

d) To reserve calculations of the deposits for industrial purposes.

e) To produce ceramic minerals and lime in each selected area.

f) To elaborate typical unit small-scale projects of semi-ceramic industries and lime.

g) To organize training courses.

h) To construct small-scale and semi-industrial units of production.

i) To elaborate technical documents and/or manuals of instruction.

3.9 Further Development of Microclimate Laboratory for the Elaboration of Energy-Saving Dimensioning and In-Door Air Pollution Testing Methods

Hungary

Duration: One year

UN input: US$ 55,800

Development objectives:

To provide an efficient tool for:

a) The application of the dimensioning and design, as well as measurement methods of in-door spaces in Hungary.

b) The application of the dimensioning, design and measurement methods in the developing countries.

Immediate objectives:

a) Expert aid for the design development planning of the laboratory.

b) Development of the instrument stock in the Microclimate Laboratory.

c) Making the designs of a manikin suitable for heat delivery tests.

d) Possibilities of Hungarian researchers to make study tours and to gain field experience in laboratories concerned with air quality tests and possessing manikins in the most advanced countries.

3.10 Workshop on Selected Building Materials for Housing and other Low-Rise Buildings

Australia

Duration: 2 weeks

Purpose of the Workshop:

To promote industrial production in the field of building materials in accordance with the Lima Declaration and Plan of Action.

To emphasize technology and products which are applicable and appropriate to developing country circumstances and highlight particular areas of technology where Australia can make a significant contribution to the development of these industries in developing countries.

To create and encourage an exchange of experience between Australian and developing country participants and among developing country participants.

Expected outcome of the Workshop:

Detailed information was given about:

- timber products;
- concrete and masonry products;
- asbestos products;
- iron sheeting and pressed metal roofing tiles;
- the usage of waste material;
- gypsum plaster
- contract and project management;
- field/plant inspections and similar activities in co-operation with local industry.

3.11 Assistance in the Marble and Stone Industry

Ethiopia

Duration: 3 years

UNIDO input (through) UNIDF/Special Donor Government: Italy

US$ 529,000

Development objectives:

a) Increased exploitation of domestic raw material resources.

b) Creation of job opportunities.

c) Improvement of foreign exchange earnings.

Immediate objectives:

a) Better and increased utilization of marble and granite resources.

b) More efficient, as well as quantitatively and qualitatively increased domestic manufacture of marble and stone products for the construction industry.

c) Production of volcanic tuff blocks for low-cost housing purposes.

3.12 Research and Development Centre for Light Building Materials

The People's Republic of China

Duration: 2 years

UN input: US$ 110,000

Government input: RMB Yuan 3,328,000 (in Kind)

Development objectives:

In order to respond to the flourishing development of the industrial and agricultural construction and solve the housing problem of the people, the Government of China intends to develop the light building materials industry to:

a) Exploit and utilize effectively the local natural resources, industrial and agricultural wastes.

b) Develop and promote the production of light, large-sized, high-strength, multi-functional building materials.

c) Accelerate the modernization of the building materials industry and the construction industry.

Immediate objectives:

The immediate objectives of the project are to:

a) Improve the quality of products of aerated concrete, paper-covered plaster-board and waterproof materials, raise the technical level of the industrial production.

b) Develop research work on the application technique of aerated concrete and plaster-board, provide technical service for the manufacturing plants and for the users of the products, popularize their utilization.

c) Train senior technical personnel of the Centre in light concrete products, gypsum building products and organic building materials.

3.13 Pilot Study on Natural Resources

Tanzania

UNIDO input: US $ 30,000

Development objectives:

To enhance techno-economic capabilities of Tanzania in their industrialization efforts in line with the objectives of the long-term Industrial Plan (1975 - 1995) of Tanzania, to establish self-reliance by utilizing its natural resources.

Immediate objectives:

To provide assistance to the Government to review the existing conditions regarding commercially exploitable mineral resources, and prepare project profiles for consideration of prospective investors of joint venture partners in the areas of gold, gemstones, coal, nickel, iron and gypsum.

3.14 Workshop on Building Industrialization

Hungary
Duration: 2 weeks

Purpose of the Workshop:

The development objective is to promote housing construction and the construction of industrial building by means of building component pre-fabrication and the development of building mechanization.

The immediate objective is to review and evaluate the different technologies in the industry, taking into account comparative advantage, appropriateness, costs and infrastructure requirements. The workshop would also aim at developing an appreciation of associated technical areas such as codes and standards. Overall, an exchange of experience between Hungarian and developing country participants and among developing country participants themselves would be aimed at.

Expected outputs:

Detailed information, both in presentation and in documents to all participants on:

a) Characterization of industrialization conditions necessary for meeting the mass home-building demands.

b) Different stages of industrialization taken as a function of the national economic resources.

c) Technologies for reinforced concrete production and structural systems in the field of home-building, community building, industrial and agricultural buildings and of public utilities and in the field of communication.

d) Industrialization methods of monolit concrete buildings and metal frame building systems.

e) Introduction of machines and equipment necessary for the industrialized block unit production.

f) Description of building systems meeting the mass building demands and introduction of their most characteristical types.

g) Introduction of production of frames, exterior walls, doors, windows and of other building system components and their utilization.

h) Laboratory and site testing methods of industrialized buildings and structures (mechanical, acoustic, air conditioning, concrete technological, etc., tests).

i) Research and Development in the field of industrialization and material production.

j) Results of the development of the Hungarian building industry achieved so far with special regard to the co-operation with the developing countries.

k) International co-operation, technological transfer, re-organization of production and the maintenance of the rendered technologies.

3.15 Technical Consultation on the Protection of Buildings from Earthquakes by Base Isolation

Malaysia

Duration: 1 week

Purpose of the Consultation:

The purpose of the Consultation was to make Government authorities world-wide aware of the advances which have been made in earthquake protection using base isolation and to indicate suitable areas of application. The Consultation promoted transfer of technology and experience to the developing countries, as well as co-operation between developing countries.

Expected Outcome of the Consultation:

Detailed information was given about:

a) Problems of earthquake damage.

b) Basic principles of base isolation.

c) Design and installation of seismic isolation bearings.

d) Protection of equipment within buildings.

e) Experience in mounting a large building on rubber for seismic isolation.

f) The use of base isolation techniques for low-cost housing.

g) Economic aspects of base isolation.

h) Retro-fitting of base isolation to existing buildings.

i) Manufacture of bearings including manufacture in developing countries.

j) Seismic codes and their impact on base isolation systems.

k) Basic principles of vibration isolation.

l) Practical experience of construction for vibration isolation.

m) Use of rubber bearings in civil engineering and standard requirements for them.

n) Rubber properties important in bearing design.

o) Design of laminated bearings.

I hope that the brief review of these 15 UNIDO projects gave you some idea of our activities in the field of building, building research and development and gave some indication on the kind of activities where UNIDO could give even more assistance to countries wishing to develop their building materials and construction sectors.